REMARKS/ARGUMENTS

Favorable reconsideration of this application is respectfully requested.

Claims 11-13 and 16-21 are pending in this application. Claims 15 and 16 are canceled by the present response without prejudice and new claim 21 is presented for examination. Claims 11 and 13-16 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. patent 5,387,555 to Linn et al. (herein "Linn"). Claims 12 and 17-20 were rejected under 35 U.S.C. § 103(a) as unpatentable over Linn in view of U.S. patent 5,877,070 to Goesele et al. (herein "Goesele").

Addressing the above-noted rejections, those rejections are traversed by the present response.

It is initially noted that independent claim 11 is amended by the present response to clarify features recited therein Certain other of the pending claims are also amended to clarify features recited therein.

More particularly, independent claim 11 is amended by the present response to clarify that at least one layer is ***directly*** deposited on the face of the first semiconductor element and at least one layer is ***directly*** deposited on the face of the second semiconductor element. Independent claim 1 also clarifies that "each of the materials chosen for each of the layers is either a semiconductor material or an electrical conductor material, at least one layer being of an electrical conductor material". That subject matter is believed to be fully supported by the original specification for example in the embodiment directed to Figures 1A-1D.

New independent claim 21 is also submitted for examination to recite similar features as noted above, and to recite features from previously pending dependent claim 14.

The features recited in amended independent claim 11 and new independent claim 21 are believed to clearly distinguish over the applied art, as now discussed.

Linn is directed to a method of wafer bonding to produce a semiconductor-on-insulator structure between a face of a first semiconductor element and a face of a second semiconductor element by heat treatment. Linn operates a deposit at least one layer of a material on a face of a first semiconductor element and then to conduct a heat treatment. More particularly, Linn discloses the formation of a dielectric layer 316 (oxide, or silicon nitride, or diamond, see for example column 3, lines 39-44, and Figures 3a-3d) on a semiconductor 302 (of silicon) before depositing a layer of polysilicon 317 and platinum 318. As a result, the depositing of the at least one layer of semiconductor or conductor material (317, 318) in Linn ***is not performed directly*** on the semiconductor element, in contrast to features now clarified in the claims, but instead is done on the dielectric layer. In such ways, Linn clears fails to teach or suggest features as clarified in the claims.

Moreover, the depositing taught by Linn is performed on only one semiconductor element 302, and is not performed onto the two semiconductor elements to be bonded. That, is, Linn does not disclose or suggest depositing layers on the silicon handle wafer 312. That feature in Linn is also in contrast to the claims as clarified by the present response.

In such ways, amended independent claim 11, and the claims dependent therefrom, clearly distinguish over Linn.

Further, with respect to new independent claim 21, that claim also distinguishes over Linn. First, new claim 21 recites similar features as in amended independent claim 11, and thus new claim 21 distinguishes over Linn for similar reasons as discussed above. Further claim 21 further sets forth that the oxide layer between a conductive layer and one semiconductor element reacts with the conductive layer and has a thickness such that the oxide formed is in a form of isolated precipitates that do not substantially harm the electrical conducting bonding. Such further features clearly distinguish over Linn as in Linn the oxide layer 316 is formed to provide an electrical insulting layer that electrically separates the first

semiconductor element 302 from the second semiconductor element 312 (see Linn at column 2, lines 59-60).

Thereby, new independent claim 21 also distinguishes over Linn.

Moreover, applicants submit no combination of teachings of Linn in view of Goesele renders obvious the claim limitations, and further Linn itself could not be modified to meet the claim limitations.

Linn discloses a step of relatively low temperature metal silicidation reactions for bonding two faces (see for example Linn at column 2, lines 60-63). Linn also includes a step of forming at least one electrically insulating layer between the conducting layer and at least one of the two semiconductor elements (see for example Linn at column 3, lines 38-53, column 5, lines 40-43, and column 6, lines 51-57). By placing an insulating layer between the silicide layer and the semiconductor element, the method disclosed by Linn does not electrically conduct bonding between the two semiconductor elements. On the contrary, Linn is directed to finding a method for forming an electrically insulating bonding between two semiconductor faces (to create a semiconductor-on-insulator structure) (see for example Linn at column 2, lines 59-60).

The claims as currently written, in contrast to Linn, are directed to a method for forming an electrically conducting bonding between two semiconductor faces, one of the benefits of the present invention being able to establish vertical electrical conduction through the substrate thus formed, as noted for example in the present specification at page 1, lines 24-26.

In such ways, one of ordinary skill in the art would not even have been directed to the device of Linn for a solution for performing an electrical conductor bonding as in the claimed invention.

Further, Linn could not be modified to remove the insulating layers therefrom.

More particularly, even if, assuming for the sake of argument, one of ordinary skill in the art considered removing the insulating layers from Linn, to have a direct contact between the conductive layer and the two semiconductor elements, the one of ordinary skill in the art would face a difficulty, explained in the present patent application, that bonding between a semiconductor material and a conducting layer is difficult to implement because a direct contact between a conductive layer and a semiconductor element can result in a consumption of a part of the semiconductor element, which becomes an important problem if the semiconductor element is a thin film (see for example the present specification at page 2, line 5, and lines 20-24). A further problem that would arise by even suggesting such a modification to Linn is the diffusion of the metal into the semiconductor element (see for example the present specification at page 2, lines 24-27), while a bonding using an oxide (as taught by Linn) is easy to control (see for example the present specification at page 1, lines 20-22).

In Linn, as the semiconductor elements 302-312 to be bonded and the interlayer 317 of a semiconductor material used for silicidation are in a single material (silicon) in the three preferred embodiments of Linn, a metal layer deposited for silicidation would have then reacted with a silicon of both the semiconductor elements 302 and 312 and the interlayer 317, consuming a part of the two semiconductor elements.

Therefore, a heat treatment operated for silicidation in Linn would induce a reaction product between the deposited materials and the semiconductor elements. In contrast to such a result from even considering modifying the teachings of Linn, a heat treatment performed for reacting deposited layers such as in amended claim 11 implies no reaction between the deposited layers and the at least one of the semiconductor elements.

The present application proposes, as a non-limiting example, depositing materials that have a temperature reaction between each other lower than those between each one and two

semiconductor elements, as for instance to choose depositing materials of W/Si and semiconductor elements of SiC, which have respective temperature reaction of about 650°C and of about 1600°C (see for example the present specification at page 8, lines 7-10). Clearly Linn does not even address such solutions.

With respect to the teachings in Goesele, as recognized in the Office Action the use of SiC in a bonding process was disclosed in Goesele, but the use of SiC for allowing an electrical bonding between two wafers of SiC was not known and was not suggested in Goesele. Goesele is also silent as to the choice of materials for succeeding with such a bonding.

In such ways, no teachings in Goesele can overcome the above-noted deficiencies in Linn.

Applicants also note that the applied art is completely silent as to how to achieve an electrical conducting bonding layer between two semiconductor elements, which is achieved in the claimed inventions. It is only the applicants of the present invention who recognized such a problem and who attempted to solve the problem of performing an electrical conducting bonding between two semiconductor elements without consuming at least one of the two semiconductor elements.

In view of these foregoing comments, applicants respectfully submit that the claims as currently written distinguish over the applied art.

As no other issues are pending in this application, it is respectfully submitted that the present application is now in condition for allowance, and it is hereby respectfully requested that this case be passed to issue.

Respectfully submitted,

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